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Research about importance of Natural Sciences given to Romanian curriculum

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Abstract

The goal of this paper is to demonstrate importance of Natural Sciences given to Romanian curriculum. The hypothesis from which I started in development of this research was to study the framework plan of pre-university system and pre-university curriculum. The conclusion that emerges is the need of introduction a new discipline, from secondary schools, which will corroborate the interdisciplinary knowledge of biology, physics, chemistry, astronomy, geography. This is founded on need of scientific literacy of future citizens, in the sense of understanding scientific concepts necessary for active participation of individuals in civic life, economic life and in community decision making.

Keywords: Natural Sciences, curriculum, inter- and trans-disciplinary approach, secondary education, education for market labour.

1. Introduction

Contemporary society, the spectacular progress of science, engineering and technology forces us to adapt to these challenges.

Human development cannot take place without peace and peace cannot be true without respect for human rights and fundamental freedoms insurance - eliminating poverty, hunger and illiteracy, imperative that found on the agenda in the form of recommendations and resolutions of international for UN, UNESCO, and of governments and inter-governmental or regional policies.

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Complex and integrated problems such as globalization, migration, intercultural, environmental protection, information explosion, poverty, conflicts, etc. claim a transdisciplinary approach to education. „ Establishment of transdisciplinary culture, which could help eliminate tensions that threaten life on our planet, is impossible without a new type of education that takes into account all dimensions of the human being" (Cozma, T., [2])

In economic crisis context is imperative to tackle the economy through sustainable growth way. *"A truly knowledge-based society needs its citizens to be involved"* said European Science and Research Commissioner, Janez Potočnik. *"We have to do more to prepare our young people for a future that will require good scientific knowledge and an understanding of technology*."(European Commission, [3]) EU leaders acknowledged that future competitiveness depended on a renovated education policy including sciences. The countries of European Union must rethink how education and training systems can deliver the skills needed by the labour market.

"Androulla Vassiliou, Commissioner for Education, Culture, Multilingualism and Youth, said: "*Rethinking education is not just of question of money: whilst it is true that we need to invest more in education and training, it is clear that education systems also need to modernize and be more flexible in how they operate to respond to the real needs of today's society. Europe will only resume sustained growth by producing highly skilled and versatile people who can contribute to innovation and entrepreneurship. Efficient and well-targeted investment is fundamental to this, but we will not achieve our objectives by reducing education budgets.*""(European Commission, [5]). Without production of goods, society doesn't have development. Current economy is not made on hands, is required top technology, that will not be widely used unless we not have well trained workers; Natural Sciences play a fundamental role.

OECD research indicate, although the number of university graduates in the EU is increasing, the number of students at technical universities in life sciences, earth sciences, or physics sciences, chemistry sciences is decreasing. According to 2005 Eurobarometer, only 15% of population is satisfied with science knowledge learned in school, although 80% believe that the sciences are essential for future prosperity of society.

In this context, it is a growth potential for job creation in production sectors, such as green economy, ICT, nanotechnologies, health, where it is shortages specialists. This suppose new labour market needs, and education must be updated in key areas like sciences - physics, chemistry, biology, geology, astronomy, mathematics and e-skills. We need pursuing policies like addressing climate change, the environment, transport and energy, health, high-tech, nanotechnologies and optimising the opportunities for international cooperation in areas such as science and technology, education, training and research.

In this manner we can achieve an inter- and trans-disciplinary learning, complete the science knowledge that can be useful our everyday life.

2. Related work

School systems must respond to changes in external conditions that redefine needs of future whole society.

Transdisciplinary approach of Natural Sciences – Physics, Chemistry, Biology, Astronomy, Geology in school is required in several imperatives: future man should be able to cope with everyday challenges, to adapt "on the fly" to be able to retrain. In this context, disciplinary qualification of modern man isn't enough to face throbbing evolution of society, science, engineering and technology, must be completed with interdisciplinary discipline like Life Sciences and Earth Sciences. In this manner we can achieve an inter- and trans-disciplinary learning, complete the science knowledge that can be useful our everyday life.

Including in Mathematics and Natural Sciences curriculum an interdisciplinary field specific of secondary level education is founded on:

- Need of functional scientific literacy of future citizens, in the sense of functional understanding of scientific concepts necessary for active participation in civic life, economic life and in community policies. (Functional scientific literacy means that a person can describe, explain and predict natural phenomena can read and understand scientific articles in newspapers and magazines, and can engage in conversations about the validity of

conclusions. Involves the fact that a person can identify scientific issues underlying national and local decisions, he can therefore to expresses positions denoting scientific and technological information. A scientifically literate citizen is able to assess the quality of scientific information on the sources and methods that generated it to properly use technical terms, and demonstrates the ability to apply the concepts and processes of science.);

- The difficulty of creating only through organized study monodisciplinary (Biology, Physics, Chemistry, Geography) a global, integrative about natural phenomena;
- The need for integrated approach of knowledge of physics, chemistry, biology, geography in a new way, inter- and trans-disciplinary.

This field of study intends as general goal the training of future citizens for creative operating regarding: problem solving skills, scientific knowledge, and appreciation of others contribution to the development of knowledge and society.

Specific competencies and associated learning contents should enable understanding the scientific knowledge, the limits of this type of knowledge in a given context and develop those skills to generate valid scientific knowledge. The syllabus of this subject will intend to create favourable conditions for each student to form and develop individual skills at a pace own, to transfer knowledge gained from a study area to another.

In Romania, for gymnasium level (V, VI, VII, VIII grade), the distribution of weekly hours for teaching/ learning in curriculum area Mathematics and Natural Sciences, respective for each discipline separately are presented in Table 1, according to Annex 1, Order of Romanian Ministry of Education, Research, Youth and Sports no. 3638 of 11.04.2001 (fig 1.) that is currently in effect.

Table 1.

Curricular area	Minim		Maxim	
	hour/week	percentage	hour/week	percentage
Mathematics and Natural Sciences	32	29,63%	34	29,82%
Mathematics	16	14,81%	16	14,04%
Physics	6	5,56%	6	5,26%
Chemistry	4	3,70%	4	3,51%
Biology	6	5,56%	8	7,02%
Sciences	16	14,81%	18	15,79%
hour/week	108		114	

Aria curriculară /disciplina	I	II	III	IV	V	VI	VII	VIII
I. Limbă şi comunicare	**7-8**	**7-8**	**7-9**	**7-9**	**9-10**	**8-9**	**8-9**	**9-10**
Limba şi literatura română	7-8	7-8	5-7	5-7	5	4	4	4
Limba modernă	-	-	2-3	2-3	2-3	2-3	2-3	2-3
Limba modernă 2	-	-	-	-	2	2	2	2
Limba latină	-	-	-	-	-	-	-	1
II. Matematică şi ştiinţe ale naturii	**3-4**	**3-4**	**4-6**	**4-6**	**5-6**	**8**	**10**	**9-10**
Matematică	3-4	3-4	3-4	3-4	4	4	4	4
Ştiinţe ale naturii	-	-	1-2	1-2	-	-	-	-
Fizică Chimie Biologie	-	-	-	-	- - 1-2	2 - 2	2 2 2	2 2 1-2
III. Om şi societate	**1**	**1**	**2-3**	**3-5**	**3-5**	**3-5**	**4-5**	**6-7**
Educaţie civică Cultură civică	- -	- -	1-2 -	1-2 -	- 0-1	- 0-1	- 1-2	- 1-2
Istorie Geografie	- -	- -	- -	} 1-2	1-2 1-2	1-2 1-2	1-2 1-2	2 2
Religie*	1	1	1	1	1	1	1	1
IV. Arte	**2-3**	**2-3**	**2-3**	**2-3**	**2-3**	**2-3**	**2-3**	**1-2**
Educaţie plastică	1-2	1-2	1-2	1-2	1-2	1-2	1-2	} 1-2
Educaţie muzicală	1-2	1-2	1-2	1-2	1-2	1-2	1-2	
V. Educaţie fizică şi sport	**2-3**	**2-3**	**2-3**	**2-3**	**2-3**	**2-3**	**2-3**	**1-2**
VI. Tehnologii	**1-2**	**1-2**	**1-2**	**1-2**	**1-2**	**1-2**	**1-2**	**1-2**
Abilităţi practice	1-2	1-2	1-2	1-2	-	-	-	-
Educaţie tehnologică	-	-	-	-	1-2	1-2	1-2	1-2
VII. Consiliere şi orientare	**0-1**	**0-1**	**0-1**	**0-1**	**1**	**1**	**1**	**1**
Număr total de ore alocate pentru trunchiul comun	16	16	18	19	23	25	28	28
Discipline opţionale	**1-4**	**1-4**	**1-4**	**1-4**	**1-3**	**1-3**	**1-2**	**1-2**
Nr. minim de ore pe săptămână	***8***	***8***	***20***	***2***	***24***	***26***	***29***	***29***
Nr. maxim de ore pe săptămână	***20***	***20***	***22***	***23***	***26***	***28***	***30***	***30***

Fig. 1. Annex 1, Order of Romanian Ministry of Education, Research, Youth and Sports no. 3638 of 11.04.2001 [6]

We can observe that the percentage of hours allocated curriculum area of Mathematics and Sciences is approximately 29, 70%, exactly 29,63% - 29,82% , as shown in the chart below (fig.2).

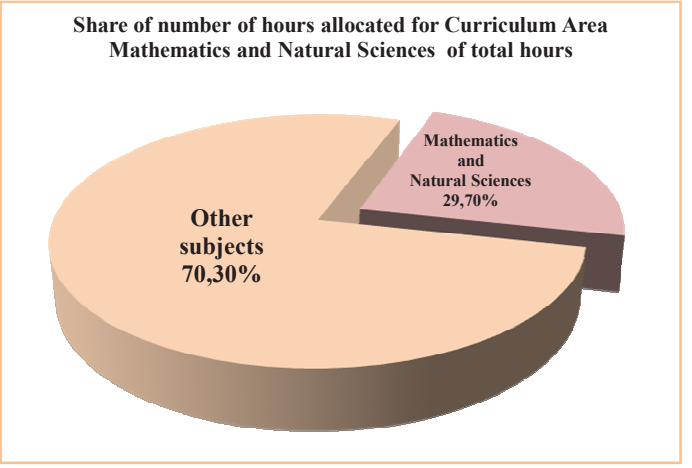

Fig. 2. Curriculum Area Mathematics and Natural Sciences

Number of hours assigned for Natural Sciences represents approximately 15% - exactly 14,81% - 15,79%, of total hours.

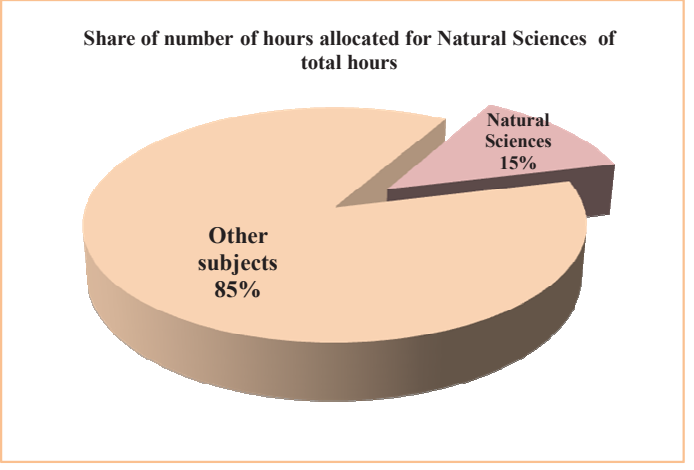

Fig.3. Natural Sciences

Number of hours assigned for Mathematics represents approximately 15% of total hours per week, exactly 14,81% for 108 hours/week, and 14,04% for 114 hours/week (table 1, fig.4).

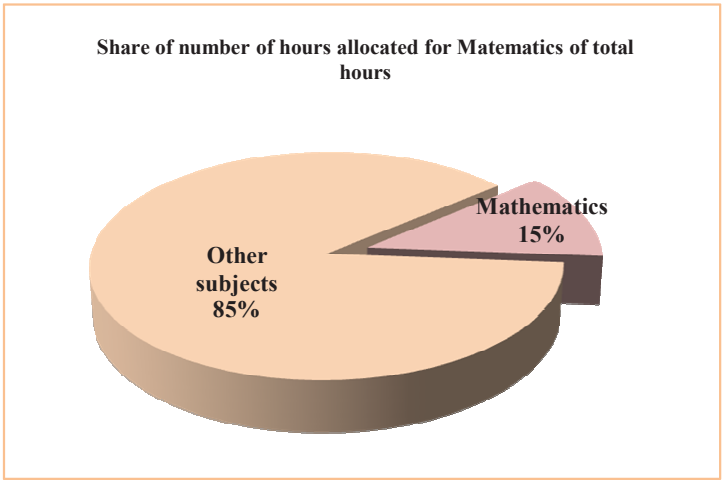

Fig. 4. Mathematics

We can observe that distribution for each discipline is according table 1: physics, only 5, 26% - 5,56% of the total allocated gymnasium, which is visualized in figure 5.

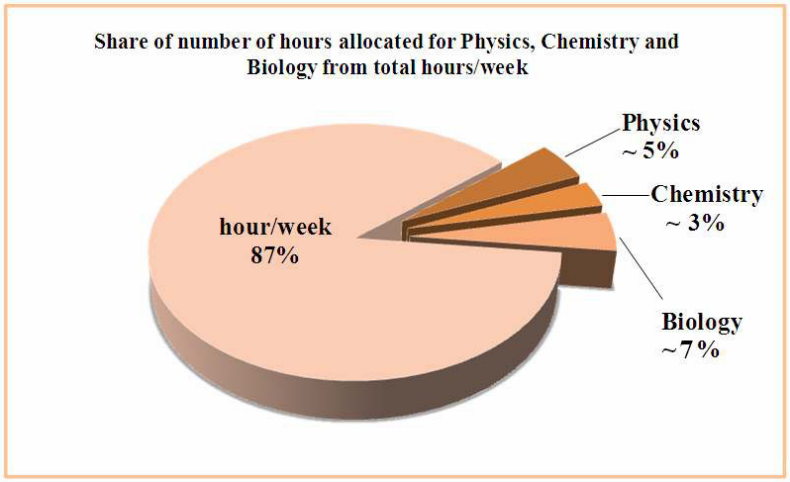

Fig. 5. Share of number of hours allocated for Physics, Chemistry and Biology

Introducing an hour for Life Sciences discipline and an hour for Earth Science discipline, would result in lowering the gap between the numbers of hours allocated humanities sciences comparative with exact sciences. It should be borne in mind that the first years of school - primary and secondary schools contribute to a general culture formation, by which the student forms for him scientific concepts about life. If the total number of hours per week remains the same, by introducing an hour for each of these fields, distribution of hours allocated exactly disciplines increases slightly, as shown in Table 2, reaching 31.48% - 31.58% , and for Natural Sciences we will have a percentage that varies between 16.67% and 17.54%

Table 2.

Curricular area	Minim		Maxim	
	hour/week	percentage	hour/week	percentage
Mathematics and Natural Sciences	34	31,48%	36	31,58%
Mathematics	16	14,81%	16	14,04%
Life Sciences	1	0,93%	1	0,88%
Earth Sciences	1	0,93%	1	0,88%
Physics	6	5,56%	6	5,26%
Chemistry	4	3,70%	4	3,51%
Biology	6	5,56%	8	7,02%
Natural Sciences	18	16,67%	20	17,54%
hour/week	108		114	

One of the major advantages would be, besides inter- and trans-disciplinary correlations, an increased number of laboratory hours, respective practical applications.

The curriculum of these disciplines should be followed:

- General competencies
- Specific Competencies
- Values and attitudes
- European key competences.

2.1. Key Competences – mathematics, natural sciences and technologies

Basic skills in natural sciences suppose:

- Knowledge – that means basic principles of nature, concepts, principles and basic scientific methods, technology, products and processes, understanding the impact of science and technology through the world, understanding advances, limitations and risks of scientific theories, applications and technology throughout society (related decisions, issues of values, ethics, culture etc.).
- Skills - ability to use and manipulate tools and technological equipment and scientific data for achieving a goal or to reach a decision or informed conclusion, recognition characteristics of scientific inquiry, ability to communicate conclusions and reasoning that led to these.
- Attitudes - critical appreciation and curiosity, interest in ethical issues and respect for safety and sustainable development, particularly in the scientific and technological progress in relation to self, family, community and global issues

2.2. General Competences

- The organization of specific knowledge in sciences field;
- Using investigation that fundamental approach in sciences;
- The understanding communication of concepts and results of investigative demarche

2.3. Values and attitude

- Respect for rigor manifested in the investigation process and knowledge in general
- Interest to data obtained by the scientific method and critical thinking about their limits
- Willingness to consider assumptions as statements to be checked (tested)

- Willingness to overcome their own beliefs in order to acquire an objective view on issues studied
- Flexibility in their viewpoints that faced with new justified data
- Respect for scientific reasoning
- Care for themselves, to others and to the environment.
- Interest to continuously improve their performance in scientific knowledge
- Scepticism for unsubstantiated generalizations on verifiable observations and repeatable

It is necessary that learners be given the opportunity to show initiative, work in groups to solve life tasks, to allow choosing from a variety of methods, using advanced technology and be able to persevere until reaching appropriate standards. On the other hand, practical training should be directed to:

- focus on practical activities the student to be involved physically, mentally and socially;
- supply of a variety of learning activities.

Teaching strategies used will be focused on developing leadership skills and effective design of exploratory and investigative work structures, phenomena and processes from natural or artificial.

Conclusions

The development of society is due of know-how technique and technology; these will could not develop without through knowledge of natural sciences and default physics, because we all know that all natural and biological processes is based by physic-chemical processes. It must therefore develop scientific knowledge of the population, and this can be achieved by introducing new disciplines, from secondary schools, which have a corroboration interdisciplinary knowledge of biology, physics, chemistry, astronomy, geography and addressing cross inter- and trans-disciplinary phenomena occurring in the living world, the micro and macro cosmos, the centre of which is man. All disciplines are useful, but society progress does not occur with words and analysis of various philosophers. People need to eat, to dress, the goods for living useful, if can benefit from a healthy and comfortable access to technology is able to use the present technology and to produce it in the future. Man of the future, the European citizen must be able to understand natural phenomena in which he live and use them for itself.

Life happens if some needs are met, which is based by physical processes:

• food - not just based on that found in nature, must it be processed (kitchen tools, robot, stove, stove, oven, microwave etc.) must be maintained (fridge, freezer, vacuum devices, etc.).

• clothing - to get it to be processed wool, cotton, silk, synthetic yarn etc.

• housing - unfortunately we cannot live under the free sky, we need housing that we must build, to maintain it and perform minor repairs themselves

• to communicate - we cannot imagine today without mobile phone, TV, PC, Laptop, iPhone, Tablet

• to travel - I imagine like without bike, car, train, plane, ship;

• electricity - produced because of physical knowledge;

• And last but not least, we must stay healthy and be able to overcome any disease, thanks to medical advances. All of these could not take place without the knowledge of physics, biology and chemistry, psychology and the connections between them. A doctor when treating a disease, a surgical operation, not treat issues separately, here's anatomy, here it applies a physical phenomenon, beyond chemical reaction occurs. He treats the body as a whole, in which all phenomena simultaneously acting in accordance with the peculiarities of each.

Physics knowledge must not taught only disciplinary, as a discipline in its own right, it should be taught and explained in a broader context, together with all other disciplines.

Effective education in all subjects and at all levels is important to the future of European culture and economy as well as to scientific research for develops the technique and technology. The goal of this paper is to demonstrate importance of Natural Sciences given to Romanian curriculum. The hypothesis from which I started in development of this research was to study the framework plan of pre-university system and pre-university

curriculum. Progresses of a society occur due to technique and technology that could not develop without thorough knowledge of the natural sciences, namely physics, chemistry, biology.

The conclusion that emerges is the need of introduction a new discipline, from secondary schools, which will corroborate the interdisciplinary knowledge of biology, physics, chemistry, astronomy, geography. It also will be a trans-disciplinary approach by addressing cross-curricular of the living world phenomena occurring at the micro and macro cosmos, in the centre of this is the man.

EU leaders acknowledged that future competitiveness depended on a renovated education policy including the European competences, as natural sciences skills. In recent years, many studies have highlighted an alarming decline in young people's interest for key science studies. This field of study is intended as general goal the purpose training future citizens for regarding the creative operating with: problem solving skills, scientific knowledge, appreciation of others contribution to the development of knowledge and society too.

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